Wyoming CCS Technology Institute
A Progress Report

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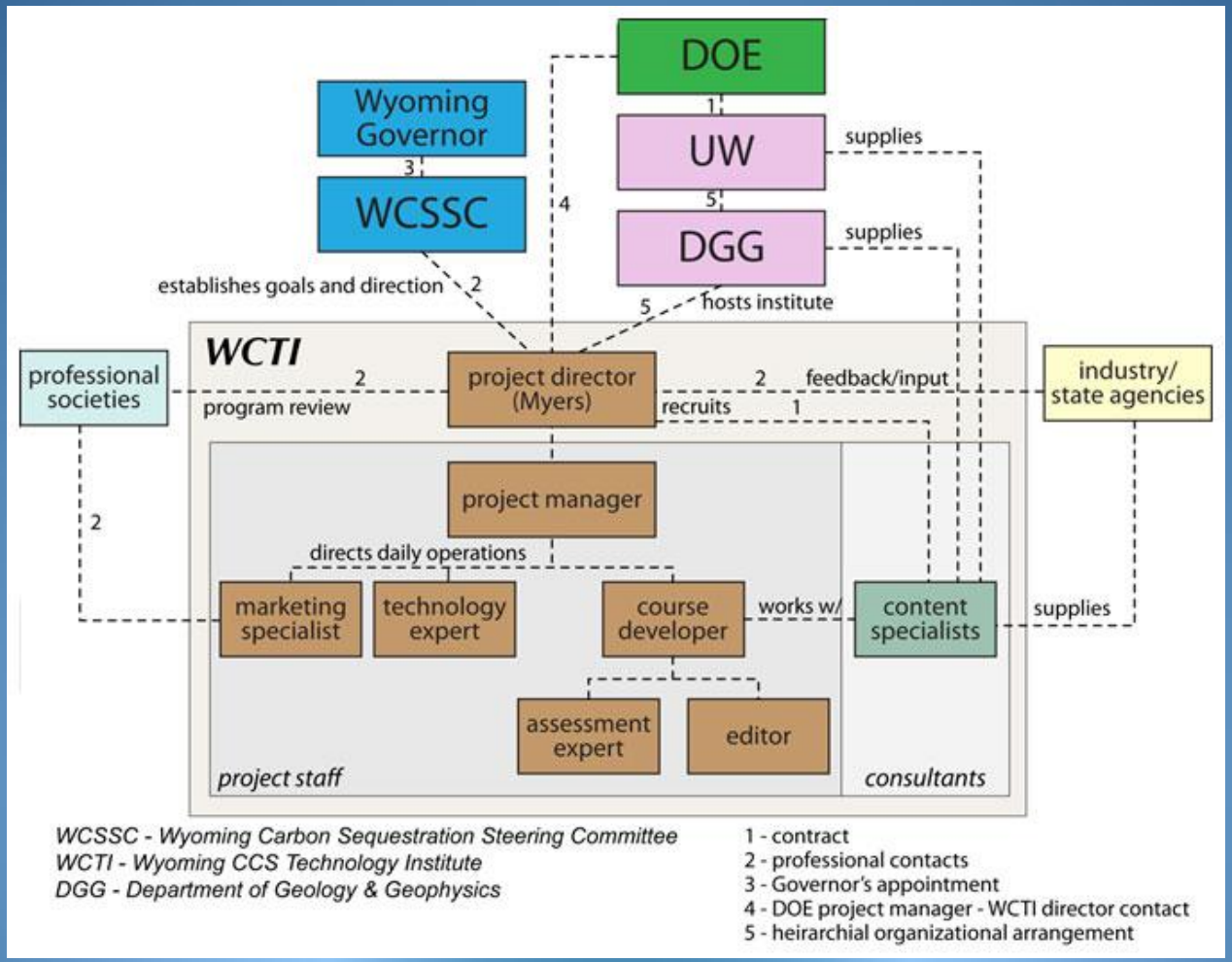
Outline

- past year's activities
- near or short-term objectives
  - next 3-5 months
- long term goals for the next year

First Year Objectives

- unlike other training centers, WCTI had no original organizational structure on which to build
  - entire institute has had to be created from scratch before educational activities could be addressed
- thus, first year primary objectives have included:
  - determining WCTI's organizational home, e.g. inside/outside Department of Geology and Geophysics
  - finding physical space on campus
  - staffing the institute
  - solving a series of legal issues, i.e. intellectual property concerns, contractual arrangements between WCTI and UW faculty and researchers for course/workshop development and instruction
- despite strong support from UW's Research Office getting cooperation from other administrative units has been time consuming
  - largely successful

Organization & Space



Staffing

- original positions
  - 4 full-time; 2 half-time
  - combined 2 half-time into full-time position and redefined
- hired or scheduled to start work soon:
  - manager: Teresa Nealon
  - marketing specialist
  - instructional technology educational specialist
- pending hires:
  - information technology specialist
  - course developer

Creation of WCTI's Online Presence

- two functions:
  - general WCTI Website; and
  - creation of platform for electronic delivery of courses and workshops
- accomplishing both tasks has been slowed by delay in hiring an information technology specialist
- position was mired in UW's re-organization of its IT support services
  - required considerable negotiation with campus IT
- position will be in IT, but funded by WCTI
  - reports to Information Technology
  - duties negotiated between IT and WCTI
  - position is currently being advertised
  - hope to fill by end of month

WCTI Website

- WCTI Website has been created
  - minimal functionality
- university is rolling out a new Web content management system next month
  - adds considerable new functionality
- WCTI's IT staff member will work with UW's marketing department to convert current Website to this new format
- http://www.uwyo.edu/wcti

WCTI's Educational Missions

- WCTI has two primary educational missions:
  - train the future CCS workforce through professional accreditation
    - short courses from WCTI's course catalog
  - promote regional CCS technology transfer
    - workshops and an online information clearinghouse
- courses and workshops developed by experts from academia, industry and regulatory agencies
  - initially content experts will be drawn from UW's CCS research efforts including:
    - evaluation of Moxa Arch
    - site characterization of the Rock Springs Uplift
    - investigation of compartmentalized depleted oil and gas reservoirs in Powder River Basin
  - Geology & Geophysics, Petroleum Engineering
    - Schools of Energy Resources and Environment and Natural Resources

Professional Accreditation

- professional accreditation is designed to prepare professionals for work in the CCS industry
- two target audiences are individuals with:
  - advanced degrees (bachelors, masters) in variety of disciplines:
    - Earth science
    - geology
    - environmental sciences,
    - petroleum engineering
  - experience in related or similar industries
    - oil/gas
    - environmental field
- courses organized around 4 professional strands
  - geologist/reservoir engineer
  - geochemist/chemical engineer

Short Course Catalog - Original

Table 1: Workforce Preparation Course Catalog

	geologist/ reservior engineer	geochemist/ chemical engineer	geophysicist/ petroleum engineer	permit writer/ regulatory/lawyer	
overview classes	An Introduction to the CCS Industry (online - asynchronous)				developed during project
	Underground Injection Control (UIC[1]): Overview (online - synchronous)				
	CCS Regulatory and Legal Framework (online - synchronous)				
	CCS Site Characterization: Best Practices (online - synchronous)				
professional classes	Site Character-ization: Estimating Storage Capacity	Site Character-ization: Baseline Geochemical Data	Site Character-ization: Geophysi-cal Methods	Site Character-ization: NEPA[2] Review	
	CCS Site Well Databases: Building	CCS Site Well Databases: Geo-chemical Uses	CCS Site Well Databases: Geo-physical Uses	CCS Site Well Databases: Evaluating	
overview classes	Measurement, Verification and Accounting (online - synchronous)				developed after project
	Carbon Sequestration Site Evaluation (online - synchronous)				
professional classes	Assessing the Seal: Methods and Procedures	CO_2: Chemistry and Fluid Properties	Monitoring CO_2: Geophysical Methods	Sequestration Site Permitting: ES[3] & EIS[4] Preparation	
	Estimating Reservoir Storage Capacity	Water Geochemistry	Well Construction: Assessing Leakage Risks	CWA[5] and CAA[6]: Implications for Sequestration	
	Displaced Fluids: Estimating Pathways	Displaced Fluids: Geochemistry & Treatment		Displaced Fluids: Dealing with Permitting Issues	
		Geochemical Modeling: Principles & Pitfalls		UCI Class IV Wells: A New Class of Injection Wells	
		Brine/CO_2/rock interactions			

[1]Underground Injection Control; [2]National Environmental Protection Act; [3]Enviromental Statement; [4]Enviromental Impact Statement; [5]Clean Water Act; [6]Clean Air Act;

Short Course Development

- WCTI's short course (and workshop) development has been extensively informed by on-campus teaching
  - in particular, a seminar on Carbon Capture and Storage
- seminar has been taught three times
  - fall, 2008: Myers and Dr. Geoff Thyne of UW's EORI
  - fall, 2009: Myers and Dr. John Kazsuba, Geology & Geophysics
  - fall, 2010: Myers and Dr. John Kazsuba, Geology & Geophysics
- approximately 20-25 students per year
  - divided between undergraduates and graduate students
  - students of these seminars match demographics of WCTI target audience
- experience useful for defining short course:
  - learning objectives
  - content
  - organization
  - learning activities

Short Course Catalog - Modified

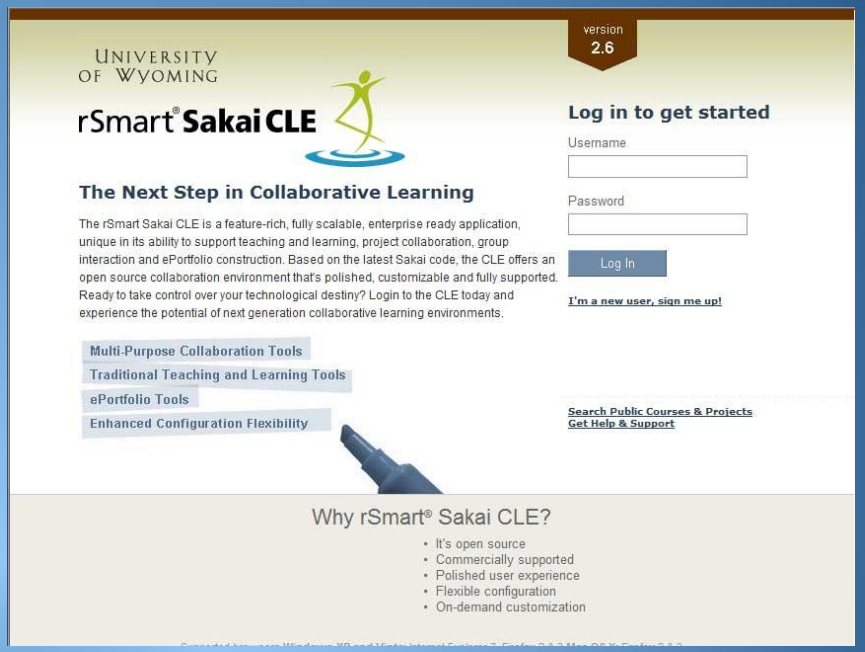
Table 1: Workforce Preparation Course Catalog

	geologist/ reservior engineer	geochemist/ chemical engineer	geophysicist/ petroleum engineer	permit writer/ regulatory/lawyer	information specialist	
overview classes	An Introduction to the CCS Industry (online - asynchronous)					developed during project
	Underground Injection Control (UIC[1]): Overview (online - synchronous)					
	CCS Regulatory and Legal Framework (online - synchronous)					
	CCS Site Characterization: Best Practices (online - synchronous)					
	CCS Site Characterization: Public Outreach & Education (online - synchronous)					
professional classes	Site Character-ization: Estimating Storage Capacity	Site Character-ization: Baseline Geochemical Data	Site Character-ization: Geophysi-cal Methods	Site Character-ization: NEPA[2] Review	Site Character-ization: EPA Requirements	
	CCS Site Well Databases: Geo-logic Uses	CCS Site Well Databases: Geo-chemical Uses	CCS Site Well Databases: Geo-physical Uses	CCS Site Well Databases: Evaluating	CCS Site Well Databases: Building	
overview classes	Measurement, Verification and Accounting (online - synchronous)					developed after project
	Carbon Sequestration Site Evaluation (online - synchronous)					
professional classes	Assessing the Seal: Methods and Procedures	CO_2: Chemistry and Fluid Properties	Monitoring CO_2: Geophysical Methods	Sequestration Site Permitting: ES[3] & EIS[4] Preparation		
	Estimating Reservoir Storage Capacity	Water Geochemistry	Well Construction: Assessing Leakage Risks	CWA[5] and CAA[6]: Implications for Sequestration		
	Displaced Fluids: Estimating Pathways	Displaced Fluids: Geochemistry & Treatment		Displaced Fluids: Dealing with Permitting Issues		
		Geochemical Modeling: Principles & Pitfalls		UCI Class IV Wells: A New Class of Injection Wells		
		Brine/CO_2/rock interactions				

[1]Underground Injection Control; [2]National Environmental Protection Act; [3]Enviromental Statement; [4]Enviromental Impact Statement; [5]Clean Water Act; [6]Clean Air Act;

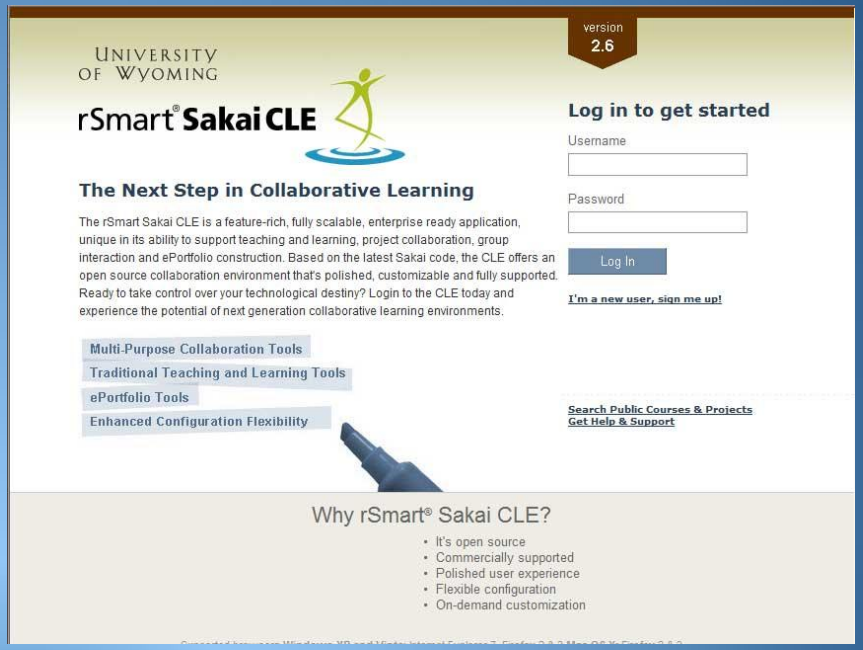
Short Course Delivery

- overview short course delivery will be through Saki
  - open-source course platform
- platform has been adopted by university
  - considerable experience using it on UW campus, e.g. Center for Teaching and Learning
  - I use it for my on-campus teaching:
    - graduate thermodynamics course
    - CCS seminar



Short Course Delivery

- Saki provides a range of toolbox functionality including:
  - calendar
  - assignments
  - chat room
  - discussion forums
  - feedback
  - news
  - podcasts
  - polls
  - Wiki



Short Course Development Tasks

- primary focus once ITES joins WCTI staff will be to create Saki template for online courses
  - will speed development
  - helps instructor define necessary technology tools
- development will concentrate on two courses initially:
  - *An Introduction to the CCS Industry*
  - *CCS Site Characterization: Public Outreach and Education*
- for both courses:
  - learning objectives have been defined
  - content outlined and selected
  - learning activities conceptually sketched out
  - reading lists compiled

Workshops: Technology Transfer

- transfer geological, technological, scientific, regulatory and legal information about Wyoming/Rocky Mountain region CCS activities
- aimed at CCS experts in academia, government and industry as well as companies considering sequestration activities in the Rocky Mountain region
- transfer accomplished through workshops that:
  - are highly technical with specific, focused subjects
  - have durations of a half day to two days
  - offered at a variety of venues
- archived on WTCI's website creating an online, electronic library of regional CCS geological and technological information

Workshops: Technology Transfer

- workshops
  - developed by WCTI
  - offered through Rocky Mountain PTTC which is based at Colorado School of Mines in Golden, CO

- **"Characterization of Madison Limestone Petrophysical Properties"**
  - August 18, 2010
  - instructors:
    - Dr. Geoffrey Thyne, Enhanced Oil Recovery Institute, University of Wyoming
    - Dr. James Myers, Wyoming CCS Technology Institute, University of Wyoming

- cancelled because of low enrollment (7)

Workshops: Technology Transfer

- **Petrophysical Characterization of the Madison Group for Carbon Sequestration Modeling: An Example from Southwestern Wyoming**
  - Colorado School of Mines
  - November 18, 2010
  - instructors:
    - Dr. Geoffrey Thyne and Dr. Mark Tomasso, Enhanced Oil Recovery Institute, University of Wyoming
- **Moving CCS from Research to Commercial Deployment: Pending Regulations, Public Perceptions and Public Outreach**
  - Colorado School of Mines
  - November 19, 2010
  - instructor: Dr. James Myers, Wyoming CCS Technology Institute.

Future

- most organizational work has been accomplished
  - staffing
  - space
  - legal
- ready to start in earnest on developing educational products:
  - overview short courses and first face-to-face short course
  - workshops
- planned short-term activities:
  - 2 workshops in November
  - 2 online courses to be completed by December
  - have booth at Geological Society of America's national meeting in Denver in November
- develop marketing strategy
  - explore how social media can be used to build and maintain clientele

Questions/Comments?

- website: http://www.uwyo.edu/wcti
- contact:
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  - Teresa Nealon, tnealon@uwyo.edu